Lake Steward

The newsletter of King County Lake Stewardship program Vol. 9, No. 3 Summer 2002

Trends told through data colletected by volunteer monitors

Rating the Health of King County Lakes

King County has over 700 lakes ranging in size from a few acres to over 22,000 acres. In the western third of the county, volunteer monitors and King County have teamed up to measure water quality in many smaller lakes since 1985. They have collected data on lake levels, water clarity, temperatures, and chemistry. King County published a report in November 2001 summarizing the results of a trend analysis performed on three measurements: water clarity, chlorophyll *a*, and total phosphorus. Of the 23 lakes with enough data for statistical reliability, significant trends (either up or down) were detected on 13 lakes: Angle, Beaver, Bitter, Desire, Fenwick, Geneva, Killarney, Lucerne, Pine, Pipe, Sawyer, Shadow, and Spring.

Analyzing water samples for trends.

Water Quality Changes

Some lakes have declined in summer water clarity over time, including Angle, Beaver, Desire, Lucerne, and Pipe, suggesting changes in their watersheds could be causing some undesirable effects. However, Lake Geneva has shown improvement in its water clarity. Six lakes have experienced significant increases in chlorophyll *a*, suggesting higher algae concentrations in summer. Those lakes include Beaver, Bitter, Desire, Killarney, Sawyer, and Spring. Lakes Fenwick and Shadow have had significant increases in total phosphorus, which is a commonly used water quality indicator.

Water clarity improved at Lake Geneva.

(continued on page 8)

Understanding Trophic State Index

In general, the amount of organic matter produced by the planktonic algae in a lake is referred to as its *trophic state*. Lakes that produce lots of algae are called "eutrophic" or highly productive, while those with little algae are called "oligotrophic," with in-between states termed "mesotrophic."

These terms were descriptive, without a way to assign them scientifically until 1977 when Robert Carlson proposed a calculation of trophic rating by using summer transparency (Secchi depth), chlorophyll, and total phosphorus values. He put the measurements on a scale of 1 to 100, based on relationships to algae volumes in the lakes he studied. Lakes with trophic indices below 40 are oligotrophic, while lakes with indices above 50 are eutrophic. Those scoring a rating of 40 to 50 are mesotrophic.

(continued on page 8)

What's Inside. . .

King County

Spring Sample Data Results

In late April, volunteer lake monitors began collecting bi-monthly water samples from lakes across King County, an effort that will last until October. Currently, we have volunteers for 47 of 55 lakes that meet the criteria for volunteer monitoring.

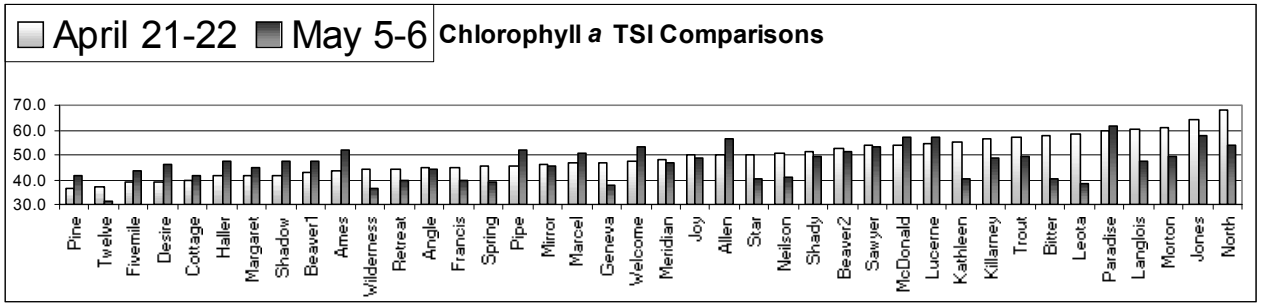
Lab Analysis

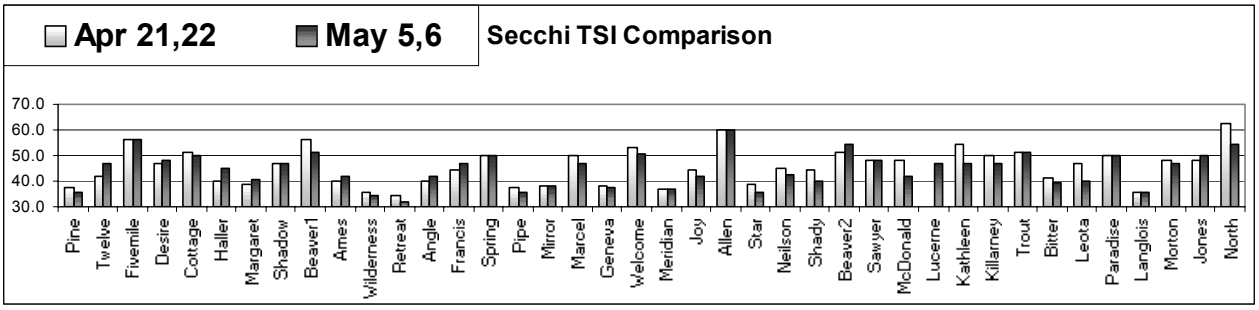
After volunteers collect the water samples, King County staff take them to the lab for analysis of two important nutrients: total nitrogen and phosphorus. The samples are also checked for chlorophyll *a* which indicates algae concentrations in the water. The results from the April 21-22 and May 5-6 sample events are shown in the charts in this article. In addition to parameters analyzed by the lab, volunteers also record water temperature and Secchi depths, a measure of clarity.

Drawing conclusions from these results would be irresponsible. To make an accurate interpretation of "water quality," more data is necessary, preferably even several years of sampling at regular intervals. However, this two-sample snapshot provides an interesting look at the ecological relationships at work every day in our lakes.

Trophic State Indicator values can be calculated from the values of chlorophyll a, secchi depth, and total phosphorus. The accompanying charts above show the TSI calculations for the April 21-22 and May 5-6 samples for all lakes with complete data for both dates. Because total nitrogen is less often used to calculate TSI, these data are not included. (For more information on TSI, see the article on page 1 entitled: "Understanding Trophic State Index.")

Temperatures are also not shown. As expected, nearly all lakes showed at least a slight rise in temperature from April 21-22 to May 5-6, reflecting the changing of the seasons. Ravensdale lake, near Black Diamond, showed the coolest April temperature at 7.5° C. Star lake near Kent was the warmest at 12°C. The average increase across all lakes was 1.8°C. Only lake Sawyer showed a decrease in temperature—by half a degree.





for April. Chlorophyll measurements are a quick way to estimate algae content in water. Note that if the May sample values were used, the lakes would be in a different order. Most lakes vary in chlorophyll between sampling dates. It is normal for algae in a lake to vary dramatically over short periods, a phenomenon you have probably noticed in your own lake. What you see can depend on windiness, types and growth rates of algae present, the small animals that eat algae, and other factors as well. High chlorophyll values in April are not a cause for alarm. Many lakes with very good average water quality will have a burst of algal growth in spring, as temperature and light increase. The nutrients circulating in the water all winter are depleted by this burst, and the lake will then settle down to support much lower populations for the rest of the year.

Secchi TSI values are not apt to change as much as chlorophyll TSI values, but there are still some changes in many lakes from one sample to the next. Lakes with a dramatic increase or decrease in algae concentrations show a corresponding change in the Secchi values; water with more algae is usually not as clear as water with less algae.

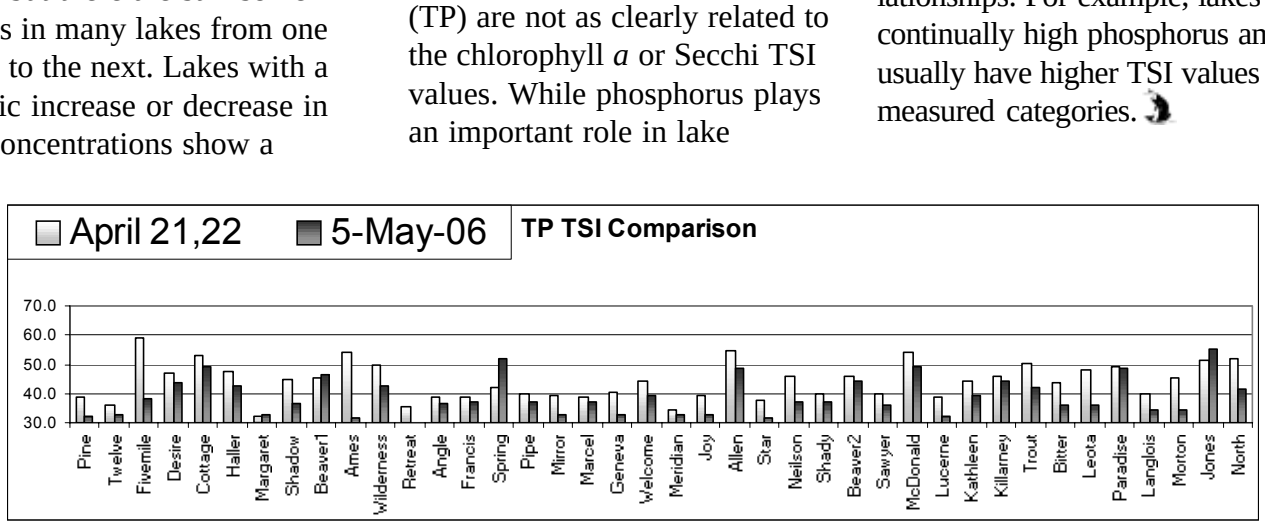
Phosphorus Totals

TSI values for total phosphorus (TP) are not as clearly related to the chlorophyll *a* or Secchi TSI values. While phosphorus plays an important role in lake ecosystems (adding more will usually increase algae growth), other factors make TP values relate less directly to chlorophyll *a* and Secchi values. Examining average values of phosphorus usually yields clearer relationships. For example, lakes with continually high phosphorus amounts usually have higher TSI values in all measured categories.

Ask Our New Aquatic Noxious Weed Specialist

The Lake Stewardship Program and the King County Noxious Weed Control Board are pleased to announce that Drew Kerr has been hired as the new wetland and aquatic noxious weed specialist with the King County Noxious Weed Control Program. Drew has worked for the Program for the past four field seasons and was recently hired into this new position. He will help the Lake Stewardship staff and lake dwellers with aquatic noxious weed issues, and will be a regular contributor to this newsletter. (See page 7: "What's that Plant? Friend or Foe?")

Drew is a graduate of the University of Michigan and holds a Certificate in Wetland Science and Management from the University of Washington. He can be reached at **(206) 296-0290** or email him at **drew.kerr@metrokc.gov.**



King County at work

Cleaning up Hazardous Waste

More than 63,000 businesses and 1.6 million citizens in King County produce small quantities of hazardous waste. If improperly disposed, this waste could pose serious health risks. For example, in 1991 county residents and businesses collectively dumped an estimated 20,000 tons of hazardous waste in the trash, down the sewer, into storm drains, or directly onto the ground. The wastes include pesticides, lead-based paints, motor oil, printing inks, and solvents. State laws now make everyone responsible for managing and properly disposing of hazardous waste, from homeowners who use paint and pesticides to small businesses with leftover solvent, ink, and oil.

In King County, a very successful program has been tackling the problem of hazardous waste for several years. The **Local Hazardous Waste Management Program** focuses on waste produced by households and small businesses. The program's goal is to reduce and properly manage that waste through education, collection, and technical assistance services. Program services include:

- Education (for the public and schools) on household hazardous waste
- Household hazardous waste collection (fixed sites and a traveling Wastemobile)
- Small business education, technical assistance, and help with compliance issues
- Hazardous Waste Library
- Industrial Materials Exchange
- Hazards Line and Business Waste Line

Since the best way to reduce waste is to not produce it in the first place, the Local Hazardous Waste Management Program encourages people to use less hazardous alternatives, especially on their lawns and in their gardens. A variety of helpful publications are available, including *Grow Smart, Grow Safe* which rates 300 lawn and garden products for their effects on health and the environment.

Getting the lead out! The Local Hazadous Waste Management Program helps area businesses reduce and better manage hazadous waste such as oils, solvents, and chemicals.

Have leftover paints and pesticides? Drop them off for free at one of the Household Hazardous Waste Collection sites.

If you do find yourself with unwanted, leftover solvents, pesticides, and other toxic household chemicals, consider dropping them off at one of the household hazardous waste collection sites. The Wastemobile also travels to many separate communities to provide free household hazardous waste disposal services for King County residents.

In addition, technical staff help small businesses with waste reduction, recycling and treatment, and the development of best management practices. The Local Hazardous Waste Management Program is funded through fees added onto commercial and residential garbage and sewer rates. It is a cooperative effort among several agencies, including Seattle/King County Public Health, King County Water and Land Resources Division, King County Solid Waste Division, and Seattle Public Utilities/Solid Waste Management and suburban cities. For more information check out their website at **www.metrokc.gov/hazwaste/** or call the general line at **(206) 263-3050**.

FYI file

Look for Dangerous Invaders

Zebra mussels *(Dreissena polymorpha)* are native to the Caspian Sea in Asia. They entered the Great Lakes Region via ballast water of a transatlantic vessel in the late 1980s. Within 10 years, these mussels had colonized the river basins of the Great Lakes, Mississippi, Tennessee, Hudson, and Ohio. Zebra mussel densities have been reported to be well over 700,000 individuals per square meter in some places in the Great Lakes area. The US Fish and Wildlife Service estimates these invasive creatures will have a potential negative economic impact of $5 billion to the US and Canada within the Great Lakes region alone over the next decade.


Beware the Zebra

A Real Menace

Zebra mussels cause far-reaching damage to water structures and native ecosystems. They attach to manmade structures, particularly pipelines, impeding water movement through hydroelectric turbines and intake structures for drinking water and irrigation systems. They also negatively impact aquatic ecosystems, harming native organisms. In huge numbers, they out-compete other filter feeders, starving them. They adhere to all hard surfaces, including the shells of native mussels, turtles, crustaceans, and each other. In the Midwest, they have destroyed boat engines, fouled beaches, and caused damage to boat ramps and docks. Zebra mussel fecal material may also contribute to taste and odor problems in drinking water sources.

Stopping the Spread

Because these tiny creatures can live for long periods out of water and cling to all kinds of hard surfaces, trailering boats from one body of water to another has significantly contributed to their rapid spread throughout the Midwest. As of June of this year, boaters are required to clean their boats and trailers of aquatic weeds and other debris before leaving a boat launch in Washington state, otherwise risk being ticketed. Hopefully, this important legislation comes in time to curtail the westward spread of zebra mussels and other invasive aquatic species.

Monitoring

Preventing the spread of zebra mussels to the Columbia River and its associated waterways is the primary objective of the Zebra Mussel Monitoring Network coordinated by the Center for Lakes & Reservoirs. Volunteers are being sought throughout the Washington who have access to lakes and rivers. They will be provided with a PVC substrate to hang on their docks and monthly reply cards. If there is a positive sighting, authorities will be alerted and will determine the extent of colonization. To date, these invasive species have not been sighted in any Washington waters.


PVC Monitoring Tube

For additional information about becoming a volunteer please contact **Toni Pennington**, Zebra Mussel Volunteer Monitoring Coordinator at **(503) 725-9075** or **toni@pdx.edu**.

Stop Aquatic Stowaways!

In addition to zebra mussels, boaters should also be on the lookout for invasive aquatic weeds. One of the most troubling is milfoil, an aggressive, non-native water weed that threatens the safety of swimmers and boaters. First discovered in Washington in the 1970s, it now flourishes in lakes Washington and Sammamish as well as a few of the smaller King County lakes. Reproducing by a process of fragmentation in which smaller pieces of the plant grow new roots, milfoil spreads to other waterbodies as people unknowingly transport fragments on their boats and trailers.

To prevent milfoil and other noxious weeds from infesting new areas, remove *all* weeds from boats and trailers each time the boat is pulled out of the water. Dispose of the weeds in a garbage can, not back in the water.

Got an itch?

Ask Dr. Lakenstein

I recently went swimming in my lake. When I came out I had red, itchy bumps all over my feet and legs. What happened?

Dear ItchyToes:
Summer is a time of splashing and wading in your local lake for a refreshing dip. It's also the time of year for "swimmer's itch," a common skin irritation which causes redness, swelling, and plenty of itchiness. Although unsightly and uncomfortable, it poses little threat to people in good health.

Blame the itch on the parasitic flatworms found in most North American lakes. Adult flatworms live and reproduce in blood vessels near the intestines of waterfowl. The bird's feces contain flatworm eggs. Once in the water, eggs hatch into larvae that will survive only if they find an aquatic snail to host the next stage of their lifecycle. While in the snail, larvae mature, then burrow out of the snail in search of a bird host where they can mature into adult flatworms and once again lay eggs. With limited perception, free-swimming larvae will attach to any warm body they encounter.

A larva attached to a human burrows into and under the skin, usually after the person leaves the water. Fortunately, the internal human environment is not favorable for flatworms, and they die. However, it is the death and decay of the burrowed larvae that irritates the skin.

Although flatworms (as well as waterfowl and aquatic snails) are common in this area, there are ways to minimize the risk of being infected:

- Avoid prolonged wading near the shoreline where there may be increased numbers of larvae.
- Vigorously towel off immediately upon exiting the water (including under bathing suits).
- Take a soapy shower immediately after exiting the water.
- Apply sunscreen or other lotion (again, everywhere) before entering the water.

None of these prevention methods are foolproof. If you do get the itch, a topical rash cream should alleviate some of the itching, and the rash should clear up within a week. If you have concerns or questions, contact a physician.

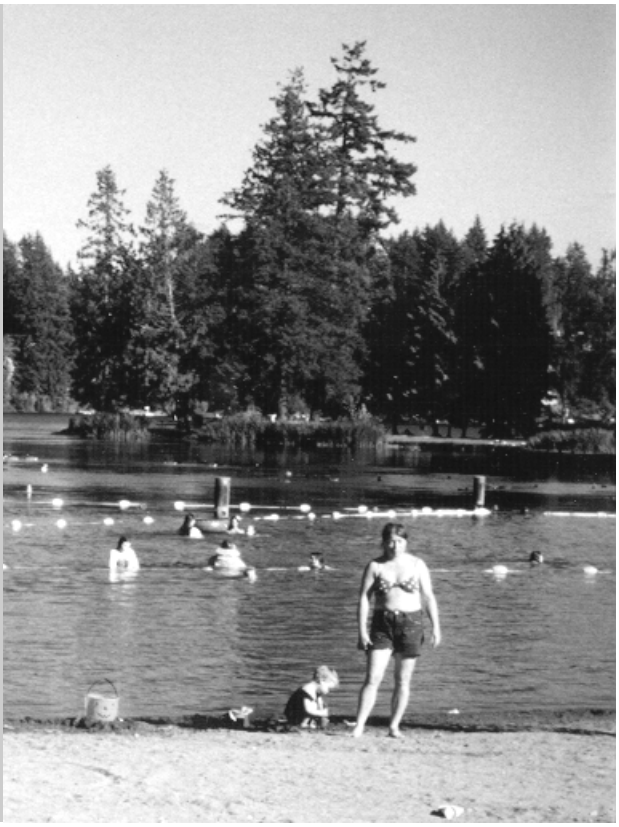
Due to the ubiquity of suitable bird and snail hosts, swimmer's itch is a possibility in almost any lake in the region. Unfortunately, water testing and control are difficult, often inconclusive, and very expensive.

For more information, try these websites:

- **http://www.hope.edu/swimmersitch/faq.html**
- **http://www.metrokc.gov/health/news/00062801.htm**
- **http://dnr.metrokc.gov/wlr/waterres/lakes/ichlink.htm**

Ways to Avoid "Swimmer's Itch"

- *Vigorously towel off immediately upon exiting the water (including under bathing suits).*
- *If possible, take a soapy shower immediately after leaving the water.*
- *Apply sunscreen or other lotion (again, everywhere) before entering the water.*
- *Avoid prolonged wading near the shoreline.*

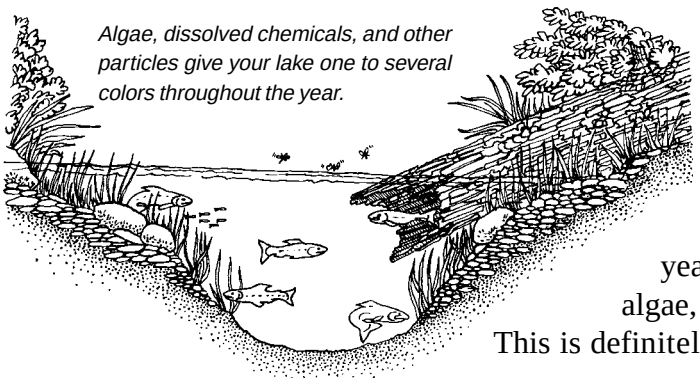


Lake ecology

Water Color vs. Water Quality

Absolutely pure water looks pale icy blue. However, very little water on earth is just pure H_2O. In fact, the impurities in water are probably responsible for the development of life on earth. All living things use the various materials dissolved and floating in water, from oxygen to food particles. You could think of your lake as soup, with the dissolved chemicals, the algae, and other particles giving it particular colors and flavors.

Most algae blooms last for a few weeks at most, but can color the water in a rainbow of shades, from greens, yellow or gold, to brownish-red, purple, and even orange. Heavy rains can wash soils and detritus in from the watershed, staining the lake tan, gray, or brown. Some lakes are "tea colored" all year round, not due to algae, animals, or floods. This is definitely not a sign of poor water quality; rather it illustrates the complexity and wonder of natural processes.



Algae, dissolved chemicals, and other particles give your lake one to several colors throughout the year.

The tea color comes from large organic molecules that wash into the lake before they are completely broken down by bacteria. This happens in climates like ours because cool temperatures slow down decomposition, while abundant moisture and high growth rates combine to produce a lot of material for the bacteria to demolish. Our sphagnum bogs, wetlands, and "cedar swamps" all produce yellow stained water. The sunlight and warm water temperatures of summer increase the amount of decomposition, but many lakes remain yellow all year.

What's that Plant? Friend or Foe?

It may have pretty pink flowers and resemble an English bobby's helmet, but *Impatiens glandulifera* is actually a Class B noxious weed in our state.

Known commonly as policeman's helmet, this plant is a fast growing annual from the Himalayas that can reach over 10 feet tall. Introduced as a garden ornamental, it escaped cultivation to become a noxious weed. It is extremely invasive to moist natural areas and spreads quickly with an ability to shoot or project its seeds 15–20 feet from the mother plant. It grows in a range of light exposure from shade to full sun.

The King County Noxious Weed Control Program is currently aware of just over 100 sites, mainly in the Bellevue, Kirkland, Auburn, and Duvall areas, containing policeman's helmet. Controlling the spread of this species is required by law. While this plant is very easy to pull, each plant can produce from 800 to 2,500 seeds, generating a mass of seedlings the following year that crowd out and replace native and beneficial plants.

Other distinguishing characteristics of policeman's helmet include a hollow, fleshy stalk with leaves that are opposite or sometimes whorled around the stem, with usually three leaves to a node. The leaves are 6 inches long, and the leaf margins are toothed with 20 'teeth' or more along each side. Adventitious roots are often found along the lower stem nodes, sometimes buttressing, helping the plant to adapt and root in very wet, shallow areas.

Policeman's helmet

Help us track this weed to keep it out of our natural areas. Please contact the County's Noxious Weed Control Program at **(206) 296-0290** or **noxious.weeds@metrokc.gov**.

Rating. . .

(continued from page 1)

Many lakes had no detectable trends. However, it must be kept in mind that trend analysis is based on measurements from past years. This means that the results reflect past conditions; they cannot predict the future, unless nothing changes at all! Careful decision making and vigilant stewardship are still necessary to preserve our Northwest heritage of abundant, clean lake water.

Trophic State. . .

(continued from page 1)

Ideally, all three measures should be roughly equivalent in a lake. If they are not, the algae or the trophic state indexes (TSIs) may be affected by factors not included in Carlson's assumptions. One example is water color. Lakes with highly colored water will often have higher TSIs for Secchi than for chlorophyll or total phosphorus. Lakes that are limited by nitrogen rather than phosphorus may also have an imbalance among their calculated TSIs.

TSI ratings do not necessarily translate into water quality ratings. There are many considerations that come into play when talking about water quality. It can be either bad or good to be highly productive, depending on the uses of a lake and its natural situation. The kind of algae is as important as the amount, especially when food for zooplankton and fish is limiting how well fish do in a lake.

If you would like a copy of The King County Lake Water Quality *report, please call* ***(206) 296-8382.***

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